

## Inhaler for powdered medicament

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### Abstract

An inhaler for powdered medicaments comprises a housing having a chamber for receiving a capsule containing a dose of the medicament to be dispensed. A duct in the housing has one end open to the atmosphere and the other end of the duct has its outlet in a mouthpiece which may be inserted into the mouth of a user. A passage connects the chamber to the duct and there is a manually operated pump for supplying air under pressure to the chamber. A flow sensor is arranged in the duct and there is a valve to prevent air under pressure and the medicament from entering the duct as well as means to operate the valve to allow air and medicament to enter the duct when the flow sensor detects a user inhaling through the duct. The valve is situated between the pump and the chamber, and the capsule and the chamber are so arranged and dimensioned that all the air supplied by the pump flows through the capsule when the valve is opened.

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## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The invention relates to an inhaler for powdered medicaments and is particularly useful in applying powdered medicaments for the relief of respiratory ailments such as asthma.

#### 2. Description of the Prior Art

Such devices are known, for example, from U.S. Pat. No. 3,155,573 (Fowler) which describes a device in which powdered medicament is entrained in a stream of air under pressure, a valve being opened to allow the stream of air and medicament to be released from the device when a user inhales through a mouthpiece.

### SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved device of this type.

Accordingly the invention provides an inhaler for powdered medicaments comprising a housing having a chamber for receiving a capsule containing a dose of the medicament to be dispensed, a duct in the housing, one end of the duct being open to the atmosphere and the other end of the duct having its outlet in a mouth piece for insertion into the mouth of a user, a passage connecting the chamber to the duct, manually operated pump means for supplying air under pressure to the chamber, a flow sensor arranged in the duct, and valve means to prevent air under pressure and the medicament from entering the duct and means to operate the valve means to allow air and medicament to enter the duct when the flow sensor detects a user inhaling through the duct, in which inhaler the valve means is situated between the pump means and the chamber, and the capsule and the chamber are so arranged and dimensioned that all the air supplied by the pump means flows through the capsule when the valve means is opened.

An advantage of this arrangement is that a very high proportion of the medicament contained in the capsule is administered to the user during one actuation of the device.

In a preferred embodiment, the flow sensor comprises a vane mounted in the duct for pivotal movement and the valve means is mounted on a lever rigidly attached to the vane.

In this case, the vane may pivot about a hinge between the lever and the duct, and the hinge may be adjacent the valve means.

Further, the valve means may be spring urged into the closed position.

An advantage of this preferred arrangement is that the user receives the dose of medicament at the correct point in the inspiratory cycle and this ensures that the inhaled drug is most efficiently utilised.

Preferably the chamber is adapted to receive a sealed capsule containing the medicament and there may be means to puncture the ends of the capsule.

A pin controlled by a sliding member may be provided to pierce one end of the capsule.

There may be a cover for the mouth piece and the cover may be provided with means to pierce the other end of the capsule.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical section through the inhaler;  
Fig. 2 is a horizontal section taken on the line 2--2 of FIG. 1; and

FIG. 3 is a plan view of the inhaler.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The inhaler comprises a housing 10 in which is formed a cylinder 11. A bellows 12 is mounted in the cylinder 11 and a non-return valve 13 is provided in the wall of the cylinder 11 to allow ingress of air to the bellows.

At the lower end of the cylinder 11 there is formed a block 14 which is recessed to house one end of a capsule 15 containing the powdered medicament to be dispensed. The capsule is held in position by means of a retaining member 16 which has a corresponding recess and which is attached by spokes 35 to a mouthpiece 17 which screws on to the housing.

Air will flow from the cylinder 11 to the capsule 15 by means of a passage 18 in the block and then through an inlet passage 19 also in the block. A valve 20 is provided to close off the lower end of the passage 18 in a manner which will be described later.

In order to puncture the ends of the capsule 15 two needles 21 and 22 are provided. The needle 21 is formed as part of a cover 23 for the mouth piece and passes into the capsule through an outlet 24 from the capsule to the mouth piece. The needle 22 is mounted on a button 25 which is carried by a connecting arm 27 which passes through a slot 28 in the housing and is rigidly attached to a sliding member 29. The member 29 can be moved along the side of the housing to press the button 25 inwardly against a spring 26 in order to puncture the capsule.

The valve 20 is mounted at one end of a vane 30 pivoted about a fulcrum 31. A spring 32 is provided which biasses the valve 20 to close the passageway 18 (FIG. 1 shows the vane in solid lines in its position where the valve is open and in broken lines in its position where the valve is closed).

The vane 30 is situated in an air duct having its inlet in the region 33 in FIG. 1 and having its outlet through holes in the retaining member 16 leading into the mouth piece.

In order to operate the inhaler a capsule 15 is first placed in position and the two ends of the capsule are punctured, first using the needle 21 and then the needle 22. The cover 23 is then removed. Pressure is then applied to the top of the bellows 12 to provide a supply of air under pressure while the valve 20 is closed because of the action of the spring 32. When the user inhales air through the mouth piece 17 flow of air through the duct from the region 33 to the mouth piece moves the vane 30 into the position shown in solid lines in FIG. 1 thus releasing the air under pressure to flow through the capsule 15 and out into the mouth piece taking with it the medicament in the capsule. In this way a thorough purge of the capsule is ensured and the dose of medicament is inhaled by the user. A typical result for the amount of medicament inhaled by the user is 91% of the medicament contained in the capsule.

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## Claims

We claim:

1. An inhaler for powdered medicaments comprising a housing, a chamber in the housing; a capsule containing a dose of the medicament to be dispensed, said capsule being located in the chamber; a duct in the housing, one end of the duct being open to the atmosphere and the other end of the duct having its outlet in a mouthpiece for insertion into the mouth of a user; an outlet passage connecting the chamber to the duct; manually operated pump means for supplying air under pressure to the chamber; an inlet passage means connecting the pump means to the chamber to carry all of the air supplied by the pump means into the capsule;
2. An inhaler as claimed in claim 1 in which the flow sensor comprises a movable vane mounted in the duct, valve means situated between the pump means and the chamber in the inlet passage for preventing air under pressure and medicament from entering the duct; a flow sensor arranged in the duct; and said valve means being operable to open in response to the flow sensor means to allow air under pressure and medicament to enter the duct when the flow sensor detects a user inhaling through the duct.
3. An inhaler for powdered medicaments comprising a housing having a chamber for receiving a capsule containing a dose of the medicament to be dispensed, a duct in the housing, one end of the duct being open to the atmosphere and the other end of the duct having its outlet in a mouth piece for insertion into the mouth of a user, a passage connecting the chamber to the duct, manually operated pump means for supplying air under pressure to the chamber, a vane pivotally mounted in the duct, and valve means to prevent air under pressure and the medicament from entering the duct, the valve means being arranged on a lever rigidly connected to the vane to allow air and medicament to enter the duct when the vane detects a user inhaling through the duct, in which applicator the valve means is situated between the pump means and the chamber, and the capsule and the chamber are so arranged and dimensioned that all the air supplied by the pump means flows through the capsule when the valve means is opened.
4. An inhaler as claimed in claim 3 in which the vane pivots about a hinge between the lever and the duct, the hinge being adjacent the valve means.
5. An inhaler as claimed in claim 3 in which the valve means is spring urged into the closed position.
6. An inhaler as claimed in claim 3 in which the chamber is adapted to receive a sealed capsule containing the medicament and means are provided to puncture the ends of the capsule.
7. An inhaler as claimed in claim 6 in which a pin controlled by a sliding member mounted externally of the housing is provided to pierce one end of the capsule.
8. An inhaler as claimed in claim 7 in which a cover is provided for closing the mouth piece when not in use, the cover being provided with an internally mounted pin to pierce the other end of the capsule.

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